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A REVIEW ARTICLE ON STROKE

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Abstract:

Stroke is a neurological disorder characterized by blockage of blood vessels. A stroke occurs when a blockage or bleed of the blood vessels either interrupts or reduces the supply of blood to the brain. When this happens, the brain does not receive enough oxygen or nutrients, and brain cells start to die. Stroke is a cerebrovascular disease. This means that it affects the blood vessels that feed the brain oxygen. If the brain does not receive enough oxygen, damage may start to occur. This is a medical emergency. Although many strokes are treatable, some can lead to disability or death.

Strokes can be broadly categorized into two main types:

***1.Ischemic Stroke:** This type of stroke occurs when a blood clot or a buildup of plaque narrows or blocks an artery, reducing blood flow to a specific part of the brain. It is the most common type of stroke, accounting for the majority of cases.*

***2.Hemorrhagic Stroke:** Hemorrhagic strokes happen when a blood vessel in the brain ruptures or leaks, causing bleeding within or around the brain. While less common than ischemic strokes, hemorrhagic strokes are often more severe and can result from conditions like high blood pressure or aneurysms.*

Common risk factors for strokes include hypertension (high blood pressure), smoking, obesity, diabetes, high cholesterol, and a family history of strokes. Age and gender can also influence stroke risk, with older individuals and men being more susceptible. Recognizing the signs of a stroke and seeking immediate medical help are crucial for minimizing brain damage and improving the chances of a successful recovery. Common stroke symptoms include sudden numbness or weakness in the face, arm or leg, especially on one side of the body; sudden confusion, difficulty speaking, or trouble understanding speech; sudden trouble seeing in one or both eyes; sudden severe headache with no known cause; and sudden difficulty walking, loss of balance, or lack of coordination.

Stroke treatment depends on the type and severity of the stroke but may involve clot-busting medications, herbal medicines, surgical interventions, and rehabilitation. Stroke survivors often require extensive medical and rehabilitative care to regain lost functions and improve their quality of life. Preventing strokes involves managing risk factors through lifestyle changes, medication, herbal medicines and, in some cases, surgical procedures to address underlying health conditions. Public awareness campaigns stress the importance of recognizing stroke symptoms and acting quickly, as time is of the essence in stroke treatment. Manage diabetes, control bp and cholesterol levels. Maintain healthy diet, exercise regularly and Quit smoking.

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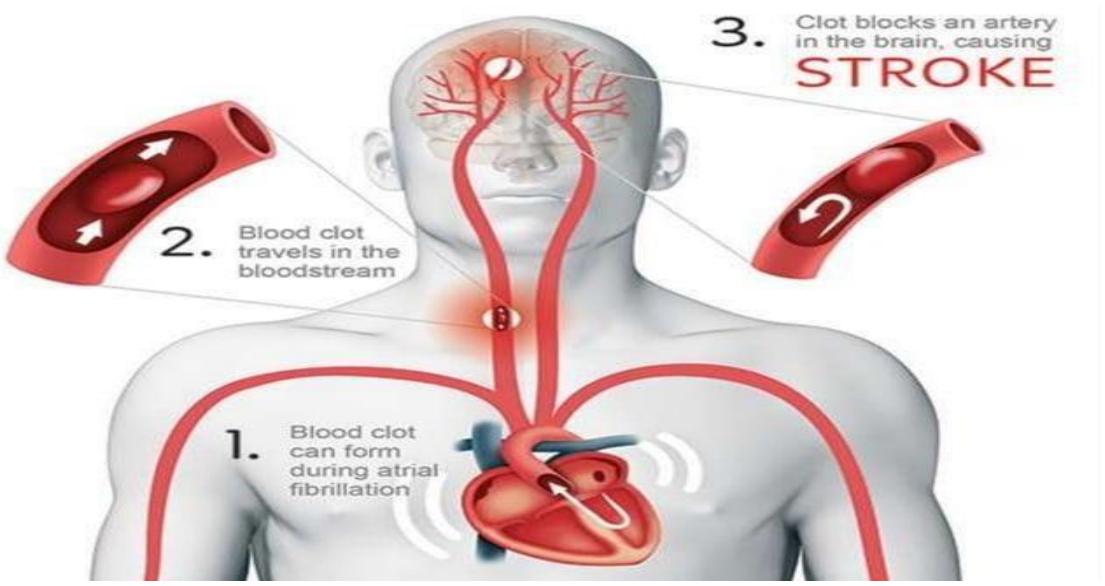
INTRODUCTION:

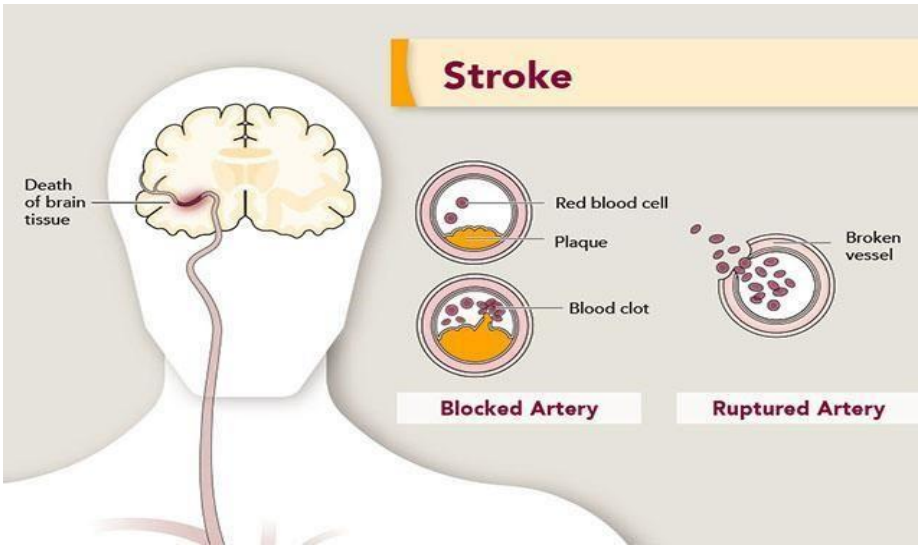
A stroke, also known as a cerebrovascular accident (CVA), is a medical condition that occurs when there is a sudden disruption of blood flow to the brain. This interruption in blood supply can lead to damage to brain cells and a range of neurological symptoms. Strokes are a medical emergency and can have severe consequences if not treated promptly.

Stroke is a life-threatening condition Clots form in the brain and interrupt blood flow, clogging arteries and causing blood vessels to break, leading to bleeding. Rupture of the arteries leading to the brain during stroke results in the sudden death of brain cells owing to a lack of oxygen. Stroke can also lead to depression and dementia.

A stroke is a medical emergency that occurs when there is a sudden interruption of blood flow to the brain, leading to the rapid death of brain cells. It is a critical and often life-threatening event that requires immediate medical attention. Strokes can have varying degrees of severity and can lead to a wide range of physical, cognitive, and emotional impairments.



What is Stroke?



Cerebrovascular accident (CVA), cerebrovascular insult (CVI), brain attack.

Stroke is defined by the World Health Organization as a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin.

Stroke is a life-threatening condition that happens when part of your brain doesn't have enough blood flow. This most commonly happens because of a blocked artery or bleeding in your brain. Without a steady supply of blood, the brain cells in that area start to die from a lack of oxygen.

Stroke is a medical condition in which poor blood flow to the brain causes cell death. In the 1970s the World Health Organization defined "stroke" as a "neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours"

There are two main types of strokes: ischemic strokes, caused by a blocked blood vessel in the brain, and hemorrhagic strokes, caused by bleeding in the brain. Understanding the risk factors, symptoms, and seeking immediate medical attention is crucial in managing strokes and minimizing their impact.

IMPORTANT: A stroke is a life-threatening emergency condition where every second counts. If you or someone with you has symptoms of a stroke, IMMEDIATELY call 911

Is it contagious?

Strokes aren't contagious and you can't pass them to or get them from other people.

WORLD STROKE DAY—29 OCTOBER

World Stroke Day is observed to remind people the impact of the prevalence and impact of strokes on communities and individuals across the globe. Strokes, also known as brain attacks, are a major global cause of disability and mortality. To conduct awareness programmes on public people.

Strokes are very common. Worldwide, strokes rank second among the top causes of death. In the United States, stroke is the fifth cause of death. Strokes are also a leading cause of disability worldwide.

SIGNS OF STROKE

Before you can help, you need to know what to watch for. To recognize the warning signs of a stroke, remember to think BE FAST:

B-Balance: Be watchful for a sudden loss of balance.

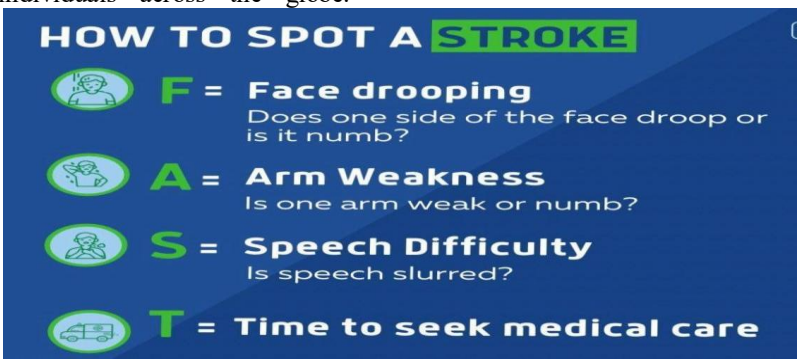
E-Eyes: Look out for sudden loss of vision in one or both eyes. Are they experiencing double vision?

F-Face: Ask the person to smile. Look for a droop on one or both sides of their face, which is a sign of muscle weakness or paralysis. .Is the face numb or does it droop on one side?

A-Arms: A person having a stroke often has muscle weakness on one side. Ask them to raise their arms. If they have one-sided weakness (and didn't have it before), one arm will stay higher while the other will sag and drop downward. Is one arm numb or weaker than the other? Does one arm stay lower than the other when trying to raise both arms?

S-Speech: Strokes often cause a person to lose their ability to speak. They might slur their speech or have trouble choosing the right words. Is speech slurred or garbled?

T-Time: Time is critical, so don't wait to get help! If possible, look at your watch or a clock and remember when symptoms start. Telling a healthcare provider when symptoms started can help the provider know what treatment options are best for you. If you answered yes to any of the above, it's time to call emergency services immediately.



SYMPTOMS OF STROKE

The symptoms of stroke can involve one or more of the following:

- One -sided weakness or paralysis.
- Aphasia (difficulty with or loss of speaking ability).
- Slurred or garbled speaking (dysarthria).
- Loss of muscle control on one side of your face.
- Sudden loss — either partial or total of one or more senses

(vision, hearing, smell, taste and touch).

- Blurred or double vision (diplopia).
- Loss of coordination or clumsiness (ataxia).
- Dizziness or vertigo.
- Nausea and vomiting.
- Stiffness.
- Emotional instability and personality changes.
- Confusion or agitation.
- Seizures and coma.
- Loss (amnesia).
- Headaches (usually sudden and severe).
- Passing out or fainting.

CAUSES OF STROKE

Ischemic strokes usually happen because of blood clots. These can happen for various reasons, such as:

- Atherosclerosis.
- Clotting disorders.
- Atrial fibrillation (especially when it happens due to sleep apnea).
- Heart defects (atrial septal defect or ventricular septal defect).
- Microvascular ischemic disease (which can block smaller blood vessels in your brain).

hemorrhagic stroke occurs when a blood vessel in the brain bursts and bleeds. Hemorrhagic strokes can happen for several reasons also, including:

- High blood pressure, especially when you have it for a long time, when it's very high, or both.
- Brain aneurysms can sometimes lead to hemorrhagic strokes.
- Brain tumors (including cancer).
- Diseases that weaken or cause unusual changes in blood vessels in your brain, such as Moyamoya disease.

EPIDEMIOLOGY

Stroke is a huge and increasing global health challenge. Worldwide, stroke is the leading cause of acquired physical disability in adults, and the second leading cause of mortality in middle-to highincome countries. In such countries, the overall incidence of ischemic and hemorrhagic stroke has risen over the last decade to 85–94 per 100,000, but is much higher (1151–1216 per 100,000) in people >75 years old. Moreover, 85% of all stroke deaths occur in low-income countries, which also account for 87% of stroke-related disability-adjusted life–years. Cerebrovascular disease is the leading cause of epilepsy in elderly individuals, and the second most common cause of late-onset dementia.

Stroke is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population-based studies.

It affects roughly 13.7 million people and kills around 5.5 million annually. Approximately 87% of strokes are ischemic infarctions, a prevalence which increased substantially between 1990 and 2016, attributed to decreased mortality and improved clinical interventions. Primary (first-time) hemorrhages comprise the majority of strokes, with secondary (second-time) hemorrhages constituting an estimated 10– 25% . The incidence of stroke doubled in low-and-middle income countries over 1990–2016 but declined by 42% in high-income countries over the same period. According to the Global Burden of Disease Study (GBD), although the prevalence of stroke has decreased, the age of those affected, their sex and their geographic location mean that the socio-economic burden of stroke has increased over time .

Age-specific stroke: The incidence of stroke increases with age, doubling after the age of 55 years. However, in an alarming trend, strokes in people aged 20–54 years increased from 12.9% to 18.6% of all cases globally between 1990 --2016. Atrial fibrillation increases stroke risk in women over 75 years by 20%.

The highest reported stroke incidence is in China, it affects (331–378 individuals per 100,000 life years)

The second-highest rate is in eastern Europe (181–218 per 100,000 life years).

The lowest in Latin America (85–100 per 100,000 life years).

Gender-specific stroke: The occurrence of stroke in men and women also depends on age. It is higher at younger ages in women, whereas incidence increases slightly with older age in men.

Based on the National Institutes of Health Stroke Scale (0 = no stroke, 1–4 = minor stroke, 5–15 = moderate stroke, 15–20 = moderate/severe stroke, 21–42 = severe stroke), mean stroke severity was estimated at 10 for women and 8.2 for men.

Both brain infarction and intracerebral hemorrhage (ICH) are common in men, but cardio embolic stroke is more prevalent among women.

Geographic and racial variation: A global population-based study of the prevalence of stroke and related risks examined demography, behavior, physical characteristics, medical history and laboratory reports, and revealed the contribution of exposure to air pollution and particulate matter to stroke mortality.

Another population-based study,

- A study conducted in north-eastern China, it found hypertension to be a statistically significant risk for stroke, specifically ischemic stroke.
- A study conducted in the United States (US) also identified hypertension as a major cause of stroke and described geographical variation in symptomatic intensity in stroke sufferers.
- Insufficient physical activity, poor food habits and nicotine and alcohol consumption were considered added risks.
- Differences in exposure to environmental pollutants, such as lead and cadmium, also influenced stroke incidences across regions.
- This study also revealed differences in stroke incidence between non-Hispanic white and black populations aged 40–50 population.

Socioeconomic variation: There is a strong inverse relationship between stroke and socioeconomic status, attributable to inadequate hospital facilities and post-stroke care among low-income populations.

A case study conducted in the US showed that people with high financial status had better stroke treatment options than deprived individuals.

A study in China linked low income and lack of health insurance to prevention of secondary stroke attack.

Research conducted in Austria associated level of education with take-up of treatments such as echocardiography and speech therapy; however, there was no difference in administration of thrombolysis, occupational therapy, physiotherapy or stroke care for secondary attack by socioeconomic status.

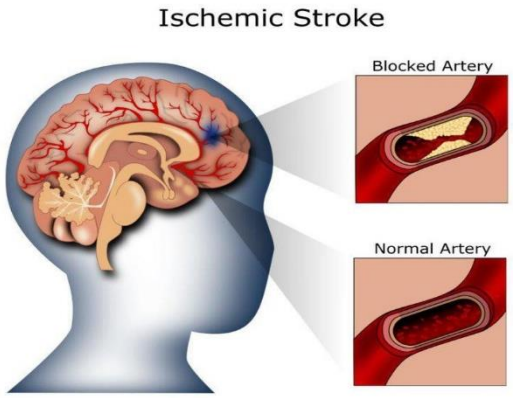
Similarly, in the Scottish healthcare system, basic treatments like thrombolysis were provided irrespective of the economic status of patients. India has the highest burden of acute coronary syndrome (ACS) in the world and the three most common risk factors for ACS are smoking (40%), high blood pressure (38%), and diabetes (30%). stroke shares common risk factors with ACS, we can safely assume that India has a very high incidence of stroke as well.

TYPES OF STOKES

Strokes can be categorized into three main types,

1. Ischemic Stroke:

Ischemia (pronounced “iss-key-me-uh”) is when cells don’t get enough blood flow to supply them with oxygen. This usually happens because something blocks blood vessels in your brain, cutting off blood flow. Ischemic strokes are the most common type, accounting for approximately 85% of all strokes. They occur when there’s a blockage or clot that obstructs blood flow to a specific part of the brain, depriving it of oxygen and nutrients.



Thrombotic Stroke: Formation of a clot in your brain (thrombosis). This type of ischemic stroke occurs when a blood clot forms within an artery in the brain, often due to atherosclerosis (plaque buildup) in the blood vessels.

Embolic Stroke: A fragment of a clot that formed elsewhere in your body that breaks free and travels through your blood vessels until it gets stuck in your brain (embolism). Embolic strokes happen when a blood clot or debris, usually originating from another

part of the body (e.g., the heart), travels through the bloodstream and lodges in a brain artery, blocking blood flow.

Subtypes: Ischemic strokes can be further divided into five subtypes:

a) **Large artery disease:** stenosis or occlusion of the large cerebral arteries (predominantly the extracranial carotid) is the cause of about 20% of ischaemic strokes . Rupture of arteriosclerotic plaques leads to in situ thrombus formation and distal embolization. In addition, ruptured carotid plaques lead to widespread platelet activation, and recurrent events are very common, particularly in the first few weeks. Less commonly, stenosis of the vertebrobasilar or intracranial arteries causes ischaemic strokes. Hemodynamics strokes can occur when systemic blood pressure drops in the context of arterial stenosis, leading to infarction of border zone territories. Extracranial dissections of cervico-cephalic arteries (sometimes traumatic) account for about 1 in 5 ischaemic strokes in patients <50 years old.

b) **Small vessel occlusions (small subcortical infarcts):** Small subcortical infarcts caused by occlusion of small perforating arteries are probably often asymptomatic but when they occur in eloquent brain areas produce 'lacunar syndromes'. The most common lacunar syndromes (and corresponding infarct locations) are pure motor stroke (posterior limb of the internal capsule), pure sensory stroke (lateral thalamus), sensorimotor stroke (thalamocapsular region), dysarthria–clumsy hand syndrome (usually pons) and ataxic hemiparesis (posterior internal capsule, pons, centrum semiovale). The progression of CSVD with accumulation of small subcortical infarcts and progressive white matter damage causes a typical clinical syndrome of progressive cognitive impairment (typically executive dysfunction) and gait disturbance with reduced stride length and falls. Small vessel blockage (lacunar stroke), which can happen when you have long-term, untreated high blood pressure (hypertension), high cholesterol (hyperlipidemia) or high blood sugar (Type 2 diabetes).

c) **Cardioembolic stroke:** a further 25% of ischaemic strokes are caused by cardioembolic disease (mainly AF), the risk increasing with age. In stroke patients, paroxysmal AF is more prevalent than persistent AF. Post-stroke AF is found in approximately 8% of individuals presenting to A&E with a stroke, 11% of those using 24–72-hour Holter monitoring and 17% of those using external or implanted loop recording; however, the clinical significance of short runs (<30 seconds) of AF is uncertain.

d) **Cryptogenic stroke:** the word "cryptogenic" means "hidden origin".In 20–30% of patients with ischaemic stroke, no cause is found. These strokes may relate to undiagnosed cardioembolic disease, hypercoagulable states, paradoxical emboli via a patent foramen ovale, sub-stenotic atheromatous disease, non-atherosclerotic arteriopathies, occult recreational drug use or undiagnosed genetic conditions or risks.

e) **Cerebral small vessel disease:** CSVD includes deep perforator arteriopathy (also termed arteriolosclerosis or hypertensive arteriopathy) and cerebral amyloid angiopathy (CAA). Deep perforator arteriopathy affects the structure and function of small vessels supplying the basal ganglia and brainstem; it causes approximately 25% of ischaemic strokes, 80% of nontraumatic intracerebral haemorrhage, and contributes to about 45% of dementia . CAA affects small vessels but is considered separately as a more important cause of ICH than ischaemic stroke . CSVD is diagnosed on the basis of radiological markers, including: recent small subcortical infarcts, white matter hyperintensities, lacunes, cerebral microbleeds, enlarged perivascular spaces and cerebral atrophy on MRI; or white matter hypodensities and lacunes on computed tomography (CT). Its prevalence increases with age with no differences between sexes, and can be higher in Asian populations. The most important risk factor for CSVD is hypertension. More rarely, genetic disorders , radiation exposure and immune-mediated vasculitides can cause CSVD.

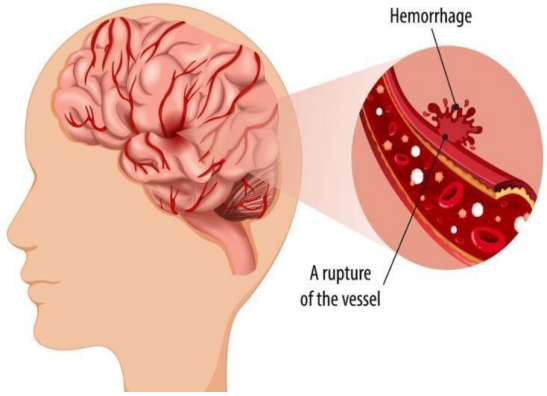
Detection of the neuro-imaging markers of CSVD can help increase confidence that an ICH is due to CSVD.CAA – a CSVD characterized by the presence of amyloid-β protein within the cortical and leptomeningeal blood vessel walls – is an important cause of lobar (but not deep) ICH in older people.After CSVD (which causes about 80% of all ICH), the next most common cause of ICH is macrovascular abnormalities (arteriovenous malformation, dural arteriovenous fistula); these are more common in (but are not limited to) younger people and can only be identified by imaging of the brain vessels (e.g. using

CT angiography, MR angiography or digital-subtraction intra-arterial angiography). Rarer causes of ICH include haemorrhagic transformation of ischaemic infarcts, venous sinus thrombosis, brain tumours, reversible cerebral vasoconstriction syndrome and endocarditis . Recreational drug use (especially cocaine) increasingly contributes to ICH in younger people.

2.Hemorrhagic Stroke: Hemorrhagic (pronounced "hem-or-aj-ick") strokes cause bleeding in or around your brain.

Hemorrhagic strokes occur when a blood vessel in or around the brain ruptures or leaks, leading to bleeding within the brain tissue (intracerebral hemorrhage) or the surrounding area (subarachnoid hemorrhage). While less common than ischemic strokes, they tend to be more severe.

Hemorrhagic strokes can be caused by conditions such as high blood pressure (hypertension), aneurysms (weakened blood vessel walls), arteriovenous malformations (abnormal connections between arteries and veins), or the use of blood-thinning medications.



(a) Intracerebral Haemorrhage: Intracerebral are the most common types of hemorrhagic strokes. Intracerebral hemorrhage involves bleeding directly into the brain tissue.

"Intracerebral haemorrhage strokes occur when bleeding takes place within the brain," Bleeding inside of your brain (intracerebral). This happens when a blood vessel inside of your brain tears or breaks open, causing bleeding that puts pressure on the surrounding brain tissue.

Spontaneous (non-traumatic) ICH can be anatomically divided into deep and lobar.

Deep hemorrhages account for approximately two-thirds of ICH cases, and occur in the basal ganglia and internal capsule (35–70%) or brainstem (5–10%).

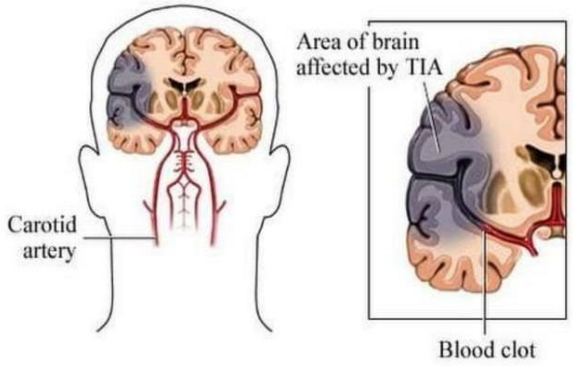
About 5–10% of ICHs are in the cerebellum.

Hypertensive (deep perforator) arteriopathy (CSVD) is the most important cause of deep ICH, although it also contributes to lobar ICH.

(b)Subarachnoid Haemorrhage: Subarachnoid haemorrhage (also known as subdural hemorrhage) involves rupture of a vessel on the surface of the brain and bleeding into the space between the brain and an envelope of tissue called the arachnoid layer. "Subarachnoid hemorrhage strokes take place when bleeding occurs between the brain and the spaces that immediately surround it due to a ruptured aneurysm or malformation."

Bleeding into the subarachnoid space (the space between your brain and its outer covering). The arachnoid membrane, a thin layer of tissue with a spiderweb-like pattern on it, surrounds your brain. The space between it and your brain is the subarachnoid space ("sub" means "under"). Damage to blood vessels that pass through the arachnoid membrane can cause a subarachnoid hemorrhage, which is bleeding into the subarachnoid space, putting pressure on the brain tissue underneath.

3.Transient ischemic attack (TIA)—A transient ischemic attack TIA), sometimes called a ministroke, is similar to an ischemic stroke because it is a temporary cut-off of blood flow to the brain. A TIA occurs when blood flow to part of the brain is blocked, often by a clot, but then dissipates after a short time and the stroke symptoms go away. "With a TIA, blood flow to the brain is usually blocked for less than 5 minutes and symptoms resolve within 24 hours, and usually much faster," "But a TIA is a warning sign that a future, more severe stroke may occur."



In other words, a TIA stroke requires immediate treatment and should be managed carefully, just like

any other stroke. Doing so can lower your risk of having a major stroke.Any stroke damage from a TIA is typically temporary or confined to a very small region, but a TIA is an important warning sign that a larger, more serious stroke could come soon. An important type of TIA due to narrowing of the carotid artery is an occasional loss of vision in one eye. Additional factors increase a person's risk for a recurrent stroke. Because TIAs last for only a few minutes, many people mistakenly ignore them.

However, taking action can save a life. Calling 911 as soon as symptoms appear can make the difference in avoiding lifelong disability. Treatment aims to prevent a recurrence, as a person who experiences a TIA has a higher riskTrusted Source of a major stroke in the future.

Symptoms: TIAs may cause symptoms similar to those of an ischemic stroke, including:

- Confusion
- Trouble walking
- Drooping on one side of the face
- Tingling or numbness

However, the symptoms tend to be less severe and last just a few minutes. Unlike an ischemic stroke, a TIA resolves on its own, when the clot either moves or dissolves.

PATHOPHYSIOLOGY OF STROKE:

Risk factors: The risk factors for a TIA are the same as those for an ischemic stroke and include:

- Being older
- Smoking
- Getting little exercise
- Having cardiovascular disease
- Having A-fib

TIAs occur before about 15% of strokesTrusted Source. This means that many people who experience a TIA will experience an ischemic stroke in the future.

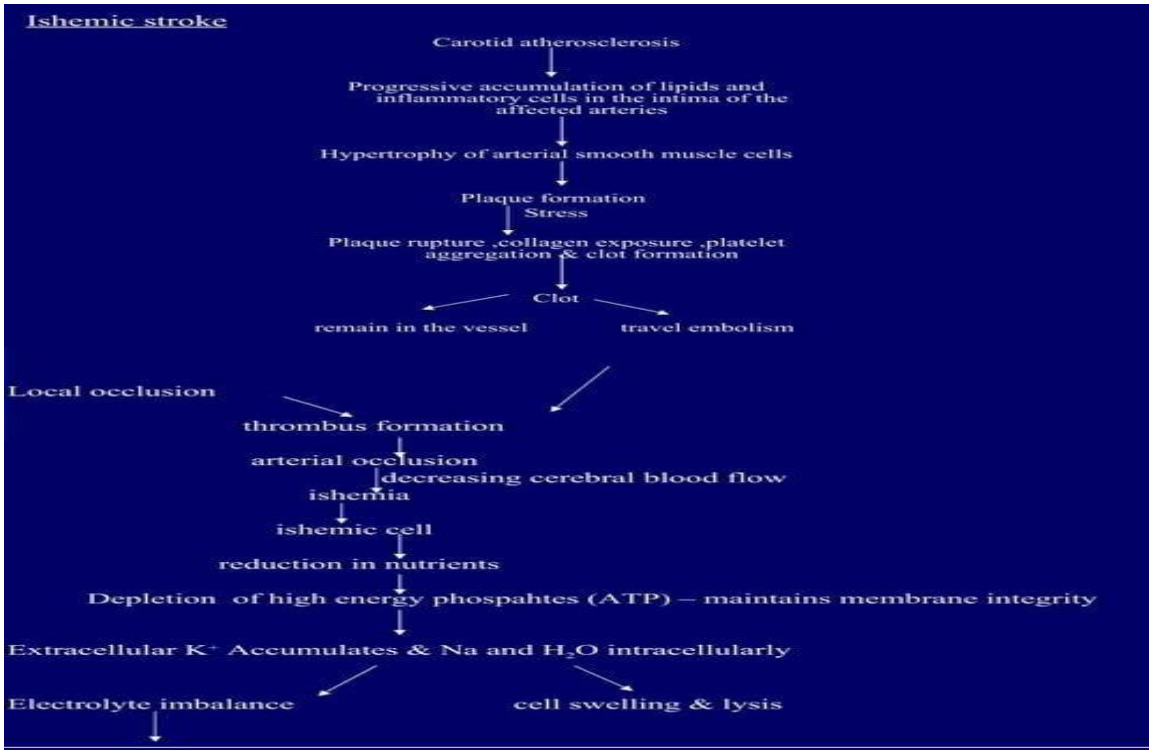
Prevention

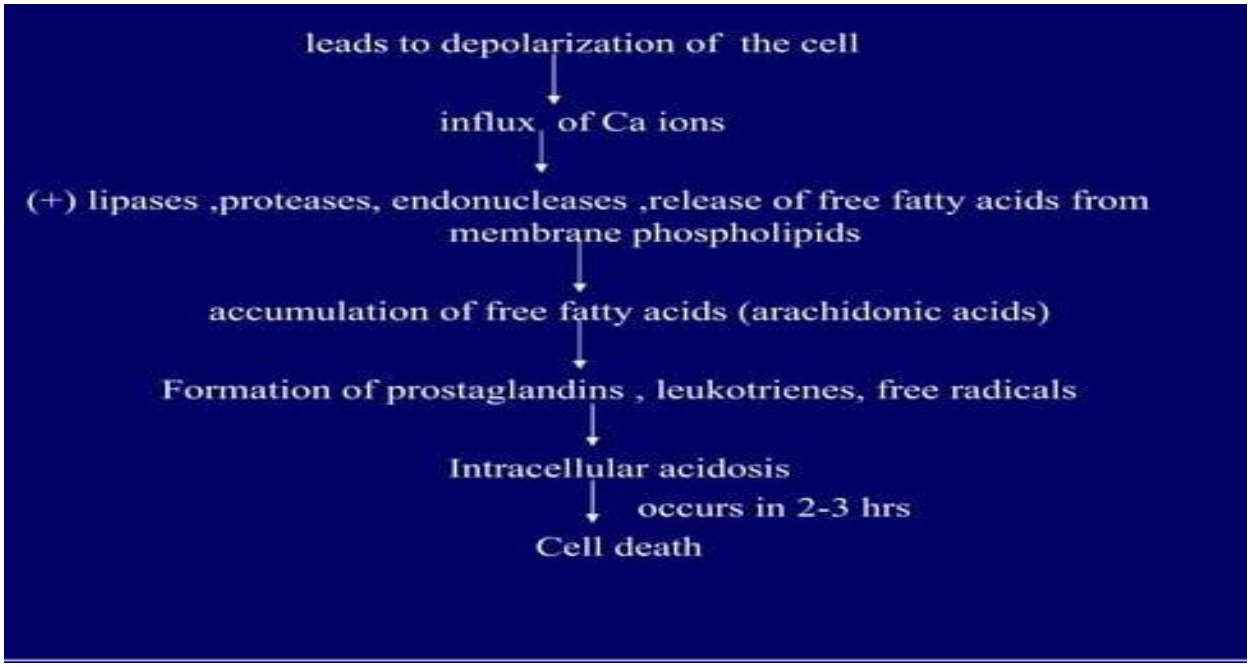
A person who has a TIA should talk with a doctor about lifestyle changes, medications, and other treatment options that can reduce the risk of experiencing an ischemic stroke.

OTHER TYPES:

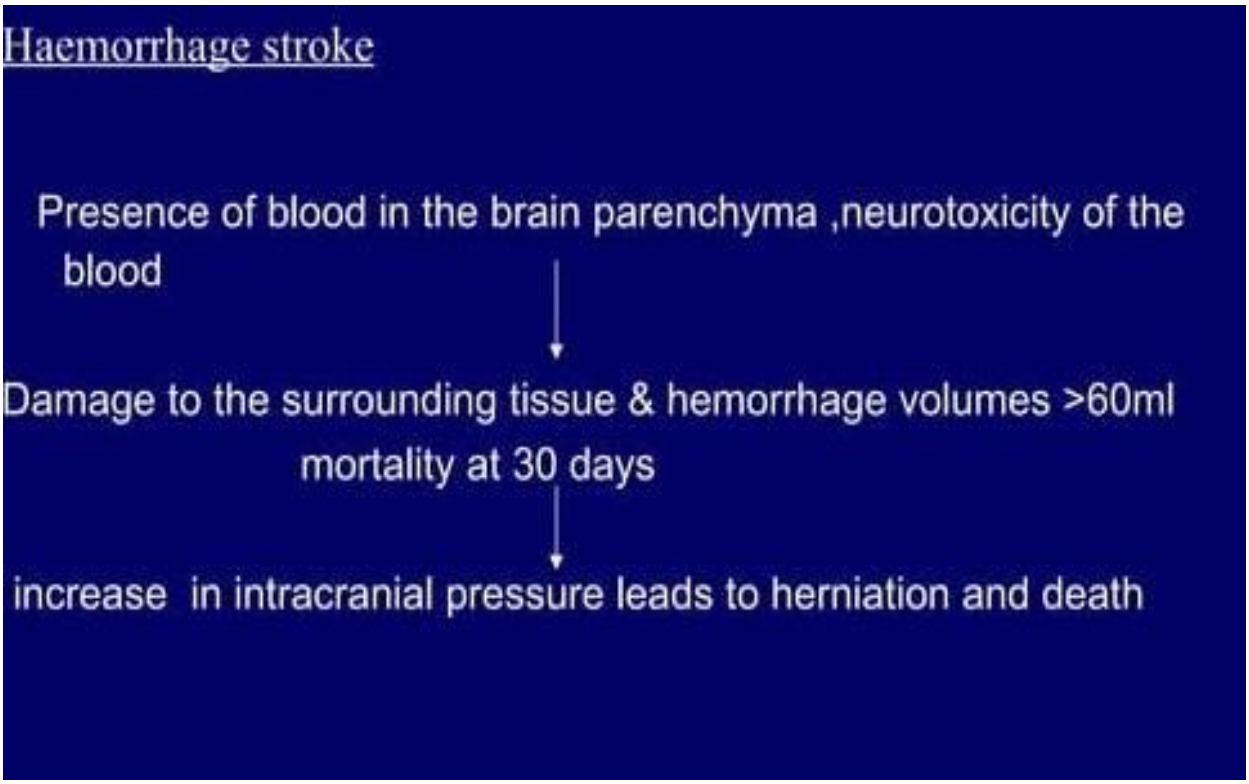
Recurrent Stroke: When a person experiences more than one stroke in their lifetime, often due to ongoing risk factors or underlying conditions.

Silent Stroke: These strokes are often symptomless and are typically discovered incidentally on brain imaging. Despite the absence of noticeable symptoms, they can still cause brain damage.





Hemorrhagic stroke:



DRUGS CLASSIFICATION OF STROKE

1.Thrombolytics: tPA, Streptokinase, urokinase, alteplase, reteplase, tenecteplase.

2.Anti platelet agents: Aspirin, dipyridamole, clopidogrel, ticlopidine.

3.Oral anticoagulants: Warfarin

4.ACE inhibitors: Perindopril, enalapril, captopril.

5.HMG CoA reductase inhibitors: Atorvastatin, Rosuvastatin, simvastatin.

6.NMDA receptor agonists: Memantine.

7.Anti seizure medications: Phenytoin.

The treatment of strokes typically involves different classes of drugs aimed at addressing various aspects of the condition. classification of drugs commonly used in the management of strokes:

1. Thrombolytics (Clot-Busting Medications):

Tissue Plasminogen Activator (tPA): This medication is administered intravenously to dissolve blood clots in ischemic strokes. It's most effective when given within a specific time frame after the stroke's onset, typically within 4.5 hours.

MOA:
They promote the conversion of plasminogen to plasmin. Plasmin degrades fibrin into fibrin degradation products and thus rapidly dissolve the blood clot.

Uses: They are commonly used in the treatment of stroke, peripheral arterial occlusion, acute MI, deepvein thrombosis, pulmonary embolism etc.

ADRS: Bleeding due to activation of circulating plasminogen, other effects include nausea, vomiting, hypotension, anaphylactic reactions, cardiac dysrhythmias can be dangerous.

Dose:

- Streptokinase: 7.5-15 lac IU infused over 1 hour
- Alteplase (rt-PA): 15mg IV bolus inj, followed by 50mg over 30 min, then 35mg over the next 1 hour,
- t-PA (tissue plasminogen activator): 0.9mg/kg IV (maximum 90kg) over 1 hour in selected patients within 3 hours of onset.

2.Antiplatelet Agents:
Aspirin: Aspirin is often given in the acute phase of ischemic strokes to prevent further clot formation.

Clopidogrel (Plavix): Another antiplatelet agent that may be used to prevent recurrent strokes.

Dipyridamole (Aggrenox): Often used in combination with aspirin to reduce the risk of recurrent strokes.

MOA: Aspirin irreversibly inhibits COX, the enzyme which is responsible for the conversion of arachidonic acid to thromboxane whereas clopidogrel and ticlopidine inhibits ADP pathway i.e., inhibits activation of ADP receptors on platelets.

Uses: They are commonly used in the treatment of transient ischaemic attack (TIA), acute MI, unstable angina, angioplastic coronary interventions, prosthetic heart valves etc.

ADRS: Common effects include nausea, vomiting, diarrhoea, serious adverse effects are severe neutropenia, fatal agranulocytosis with thrombocytopenia has occurred within the first 3 months of therapy.

Dose:

- Aspirin: 75-325mg OD
- Dipyridamole + aspirin: 200mg + 25mg 1 capsule BID
- Clopidogrel: 75mg OD
- Ticlopidine: 250mg BID

3. Anticoagulants:
Warfarin (Coumadin) or **Direct Oral Anticoagulants** (DOACs): These medications are used in certain cases to prevent blood clots, especially in patients with atrial fibrillation, which is a risk factor for embolic strokes.

MOA: They interfere with the synthesis of vitamin K dependent clotting factors in liver. Clotting factors II, VII, IX and X are synthesized in liver as inactive proteins. These factors are rich in glutamic acid residues and are carboxylated in liver where vitamin K acts as a cofactor. Vitamin K is converted to inactive epoxide from by oxidation and is regenerated to its active form by epoxide reductase enzyme. Warfarin is structurally similar to vitamin K, hence it competitively inhibits the synthesis of vitamin K-dependent factors by inhibiting epoxide reductase enzyme and thus produces anticoagulant effect.

Uses: They are commonly used in the treatment of cerebrovascular diseases, deep vein thrombosis and

pulmonary embolism, myocardial infarction, unstable angina, atrial fibrillation, disseminated intravascular coagulation etc.

ADRS: Bleeding, skin necrosis, purple toe syndrome, teratogenicity, osteoporosis, other effects include agranulocytosis, leukopenia, diarrhoea, nausea, anorexia etc.

Dose: warfarin-5mg daily, maintenance dose: 2-10mg for 2 days.

4. Blood Pressure Medications:

Antihypertensive Drugs: High blood pressure is a significant risk factor for strokes. Medications like ACE inhibitors, beta-blockers, calcium channel blockers, and diuretics may be prescribed to control blood pressure.

MOA: They mainly act by lowering blood pressure by reducing peripheral vascular resistance (PVR). They block the angiotensin converting enzyme (ACE) that cleaves angiotensin I to from the potent vasoconstrictor angiotensin II. ACE inhibitors decrease angiotensin II and increase bradykinin levels. They also decrease the secretion of aldosterone, resulting in decreased sodium and water retention.

Uses: They are commonly used in the treatment of hypertension, congestive cardiac failure, acute MI, diabetic nephropathy, stroke etc.

ADRS: Cough, angioedema, proteinuria, teratogenic effect, neutropenia, rashes, itching, loss of sensation, nausea etc.

Dose:

Perindopril: 4mg OD
Enalapril: 5mg OD • Captopril: 25mg OD

5. Statins:

Atorvastatin (Lipitor), **Simvastatin** (Zocor): Statins are prescribed to lower cholesterol levels and reduce the risk of atherosclerosis, which can lead to ischemic strokes.

MOA: Statins competitively inhibit HMG-CoA reductase, the rate limiting step in cholesterol biosynthesis (i.e., the conversion of HMG- CoA to mevalonate). This results in a decreased blood LDL and VLDL levels. Thus, statins are very effective in reducing the risk of stroke in patients with coronary artery disease and elevated plasma lipids. They also reduce triglycerides (TGS) and increase HDL cholesterol levels in plasma.

Uses: They are commonly used in the treatment of stroke, primary hyperlipidaemias with increased LDL and cholesterol levels. They are also used in secondary hyperlipidaemias due to diabetes or nephrotic syndrome.

ADRS: Hepatotoxicity, headache, sleep disturbances myopathy, anorexia, nausea, vomiting, diarrhoea etc.

Dose:

- Atorvastatin: 10-20mg OD
- Rosuvastatin: 10mg OD
- Simvastatin: 40mg OD

6.Neuroprotective Medications (Experimental):

NMDA Receptor Antagonists: Drugs like Memantine are being studied for their potential to protect brain cells during and after a stroke.

MOA:

Memantine blocks the NMDA-receptor subtype of glutamate receptors preventing over-activation of glutamine receptors while allowing the normal activity.

Uses: It is used to slow the neurotoxicity thought to be involved in Alzheimer disease and other neurodegenerative diseases.

Dose: memantine:60mg /day.

7.Anti-seizure Medications:

Phenytoin (Dilantin) or **Levetiracetam** (Keppra): These may be prescribed if seizures occur as a result of a stroke.

Medications for Symptom Management:

Pain Relievers: If a patient experiences a severe headache as a result of a hemorrhagic stroke, pain relief medications may be administered.

Anti-emetics: To control nausea and vomiting, which can occur after a stroke.

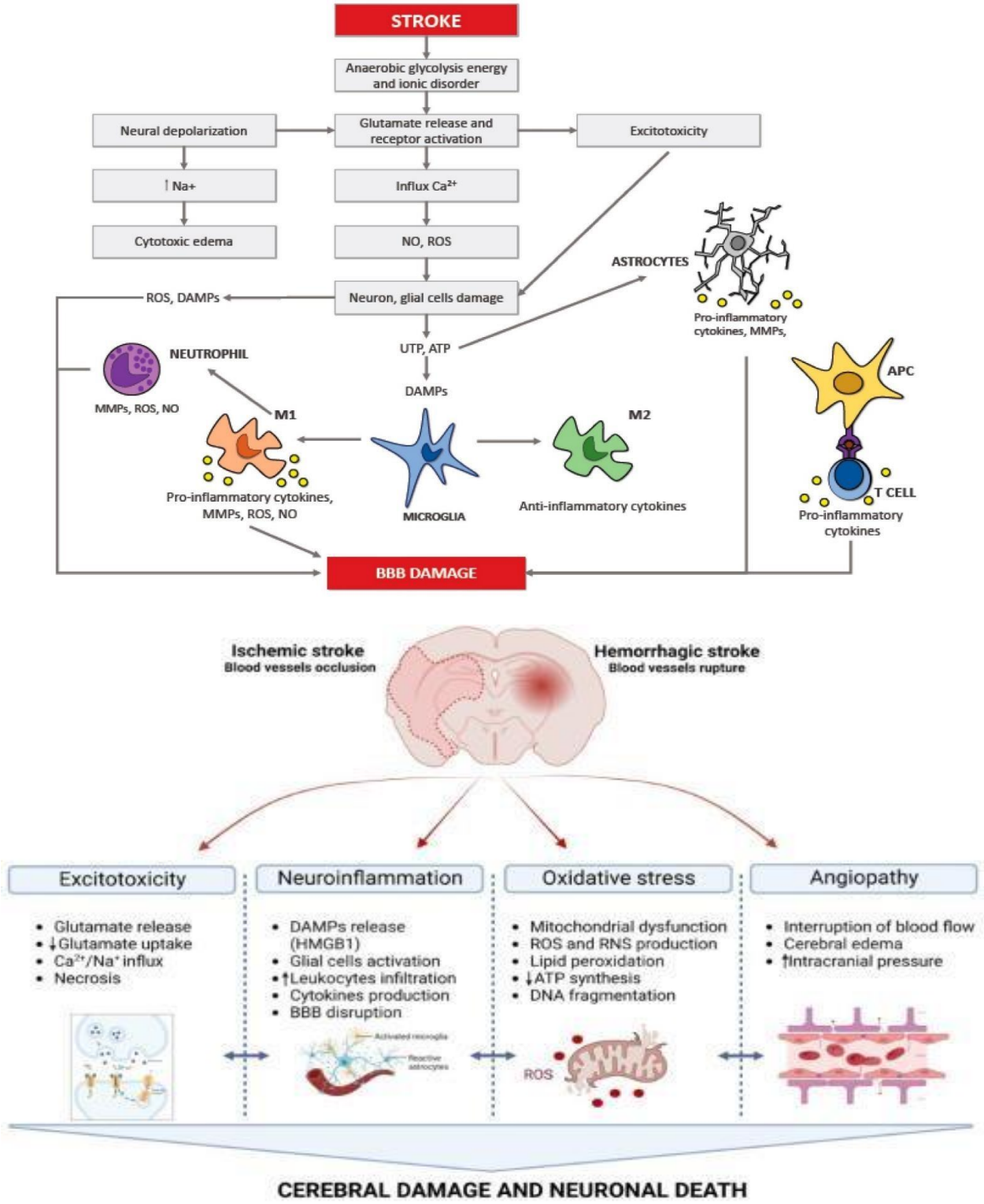
Medications for Secondary Prevention:

Medications for Diabetes, High Cholesterol, and Other Underlying Conditions: Managing underlying health conditions that increase stroke risk is crucial to preventing recurrent strokes.

Stroke treatment should always be administered under the guidance of healthcare professionals who can determine the most appropriate medications and interventions for each patient. Early medical attention and adherence to prescribed medications are critical

for optimizing stroke recovery and reducing the risk of recurrence.

MECHANISM OF ACTION OF STROKE



DIAGNOSIS

Stroke is diagnosed through several techniques: a neurological examination (such as the NIHSS), CT scans (most often without contrast enhancements) or MRI scans, Doppler ultrasound, and arteriography. During a neurological examination, a healthcare provider will have you do certain tasks or answer questions. As you perform these tasks or answer these questions, the provider will look for telltale signs that show a problem with how part of your brain works.

Clinical Assessment:

Medical History: The healthcare provider will gather information about the patient's medical history, including risk factors for stroke (e.g., hypertension, diabetes, smoking), any previous strokes or transient ischemic attacks (TIAs), and current medications.

Symptom Evaluation: The healthcare provider will assess the patient's symptoms, focusing on signs such as sudden weakness, numbness, speech difficulties, visual disturbances, or severe headache. The use of the FAST acronym (Face, Arm, Speech, Time) can help in recognizing stroke symptoms quickly.

Physical examination: A physical examination, including taking a medical history of the symptoms and a neurological status, helps giving an evaluation of the location and severity of stroke. It can give a standard score on e.g., the NIH stroke scale.

Do a physical exam, including a check of

- Your mental alertness
- Your coordination and balance
- Any numbness or weakness in your face, arms, and legs
- Any trouble speaking and seeing clearly

CT scan:

For diagnosing ischemic (blockage) stroke in the emergency setting:

CT scans (without contrast enhancements)

Sensitivity= 16% (less than 10% within first 3 hours of symptom onset)

Specificity= 96%

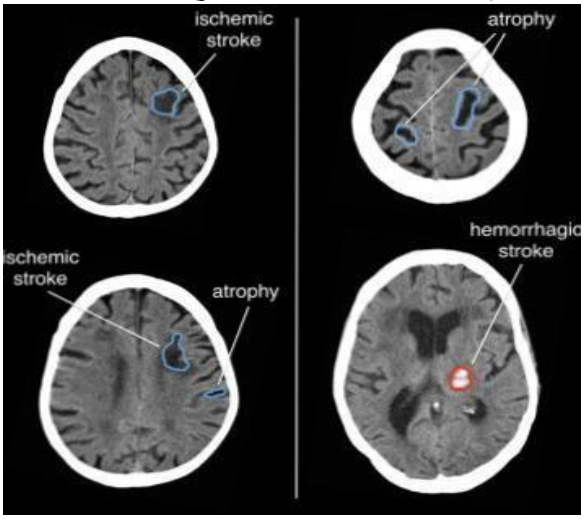
For diagnosing hemorrhagic stroke in the emergency setting:

CT scans (without contrast enhancements)

Sensitivity= 89%

Specificity= 100%

CT scans may not detect ischemic stroke, especially if it is small, of recent onset, or in the brainstem or cerebellum areas (posterior circulation infarct).



A CT scan is used more to rule out certain stroke mimics and detect bleeding.

A CT scan of the brain is often the first diagnostic test performed in suspected stroke cases. It can quickly differentiate between ischemic and hemorrhagic strokes. Ischemic strokes may not appear on a CT scan immediately but can show changes over time.

MRI scan:

For diagnosing ischemic (blockage) stroke in the emergency setting:

Sensitivity= 83%

Specificity= 98%

For diagnosing hemorrhagic stroke in the emergency setting:

Sensitivity= 81%

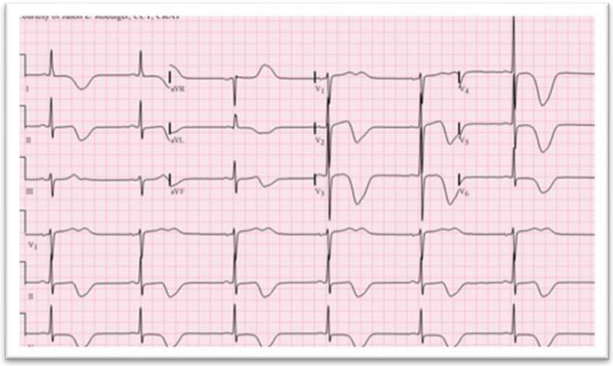
Specificity= 100%

For detecting chronic hemorrhages, an MRI scan is more sensitive.

MRI is better at detecting a posterior circulation infarct with diffusion-weighted imaging.

An MRI can provide more detailed images of the brain and is particularly useful for detecting ischemic strokes, especially in the early stages. It can also help identify the extent of brain damage.

Underlying cause :



12-lead ECG of a patient with stroke, showing large deeply inverted T-waves.

. Various changes may occur in people with stroke and other brain disorders.

When stroke has been diagnosed, various other studies may be performed to determine the underlying cause.

Transcranial Doppler Ultrasonography (TCD):
TCD uses ultrasound to assess blood flow in the brain's blood vessels and can help evaluate blood flow velocities.An ultrasound/doppler study of the carotid arteries (to detect carotid stenosis) or dissection of the precerebral arteries. Cerebrovascular reserve capacity is another factor that affects stroke outcome – it is the amount of increase in cerebral blood flow . The increase in blood flow can be measured by PET scan or transcranial doppler sonography. However, in people with obstruction of the internal carotid artery of one side, the presence of leptomeningeal collateral circulation is associated with reduced cerebral reserve capacity.

Echocardiography:
An echocardiogram to identify arrhythmias and resultant clots in the heart which may spread to the brain vessels through the bloodstream. This imaging test may be done to examine the heart's structure and function, looking for potential sources of emboli that could cause a stroke.

Blood Tests: Blood tests to determine if blood cholesterol is high, if there is an abnormal tendency to bleed, and if some rarer processes such as homocystinuria might be involved.

- Complete Blood Count (CBC):To check for anemia and infection.
- Coagulation Tests:Such as PT (Prothrombin Time) and INR (International Normalized Ratio) to evaluate blood clotting function.
- Blood Sugar Levels:High blood sugar can mimic stroke symptoms or increase stroke risk.

Electrocardiogram (ECG or EKG): An ECG is performed to assess heart rhythm and detect any irregularities that may contribute to stroke risk, such as atrial fibrillation (AFib).An electrocardiogram (ECG) to identify arrhythmias and resultant clots in the heart which may spread to the brain vessels through the bloodstream.A Holter monitor study to identify intermittent abnormal heart rhythms;

Lumbar Puncture (Spinal Tap):

In some cases, a lumbar puncture may be performed to analyze cerebrospinal fluid (CSF) for signs of bleeding or infection.

CT Angiography (CTA) or Magnetic Resonance Angiography (MRA):

These tests can visualize the blood vessels in the brain and neck to identify blockages or aneurysms.An angiogram of the cerebral vasculature (if a bleed is thought to have originated from an aneurysm or arteriovenous malformation).

For the assessment of stable stroke, nuclear medicine scans such as single-photon emission computed tomography (SPECT) and positron emission tomography–computed tomography (PET/CT) may be helpful. SPECT documents cerebral blood flow, whereas PET with an FDG isotope shows cerebral glucose metabolism.

RISK FACTORS OF STROKE

Non Modifiable Risk factors:

Age: This is the most important contributor to stroke risk. The incidence doubles for each decade after age 55 years.

Sex: Because of the risks of pregnancy and oral contraceptive use, premenopausal women have a stroke risk that is as high as or higher than the risk in men. At older ages stroke rates are slightly higher in men. Overall, more women than men have strokes in the UK.

Ethnicity: African Caribbean individuals in the UK and USA have twice the risk of incident stroke compared with their white counterparts. In younger black adults the risk of ICH is twice that of age-matched white people. This may in part relate to the increased prevalence of stroke risk factors, such as uncontrolled hypertension, obesity and diabetes,

among African Caribbean populations. Other ethnicity-related risks contributing to stroke include carotid stenosis in white individuals, the metabolic syndrome in South Asians and Pacific islanders, and increased rates of intracranial stenosis and ICH in East Asian populations.

Genetics: In addition to the single-gene disorders that are associated with stroke (CADASIL, CARASIL, Fabry's disease, homocystinuria, sickle cell disease, connective tissue disorders), the MEGASTROKE consortium identified 32 genome-wide significant loci, 22 of which were novel.3 Some loci were strongly linked to particular stroke mechanisms (e.g. large artery disease, small artery disease, cardiac embolism), while half the loci showed a shared genetic association with other vascular pathologies, the largest correlation being for blood pressure.

Modifiable risk factors:

Hypertension: This is the most important modifiable risk factor overall for stroke. Approximately half of all stroke patients, and an even greater proportion of those with ICH, have a history of hypertension. Even among those not defined as hypertensive, the higher the blood pressure, the higher the risk of stroke.The attributable risk from hypertension declines after age 60 years, where it confers relative risk of 3.5, to a non-significant contribution at age 80.

Smoking: This doubles the risk of stroke. Smoking cessation rapidly reduces the risk, with excess risk nearly disappearing 2–4 years after stopping.

Alcohol consumption and substance abuse: Light and moderate alcohol consumption (<4 units/day) has been reported to be associated with a lower risk of ischaemic stroke, whereas higher quantities are clearly associated with increased stroke risk. Alcohol consumption has a linear relationship with ICH risk. Recreational drugs including cocaine, heroin, amphetamines, cannabis and ecstasy are associated with an increased risk of stroke (both ischaemic stroke and ICH).

Obesity and sedentary behaviour: most of the effect of body mass index on stroke risk is mediated by blood pressure, cholesterol and glucose concentrations. People who are physically active have a lower risk of stroke and overall stroke mortality than those who are inactive.

Hyperlipidemia: The relationship between dyslipidaemia and stroke is complex. There is an increased risk of ischaemic stroke with increased total cholesterol, and a decreased risk of ischaemic stroke with elevated high-density lipoprotein-cholesterol. In contrast, total cholesterol is inversely associated with risk of ICH. Current evidence and expert opinion favours offering statins to survivors of ICH who have a strong indication for their use (e.g. clinically relevant ischaemic heart disease).

Diabetes mellitus: This is an independent risk factor for stroke, associated with a 2-fold increased risk. Stroke accounts for 20% of all deaths in people with diabetes.

Cardiac factors: cardioembolic infarction (mainly from atrial fibrillation (AF)) is the most severe ischaemic stroke subtype, with high disability and mortality. The presence of AF increases with age, causing 20–25% of strokes in patients >80 years old. Anticoagulation is extremely effective in preventing stroke in people with AF (relative risk reduction about two-thirds).

Inflammation: raised inflammatory biomarkers have a modest association with increased risk of arteriosclerosis and stroke. Infection can trigger stroke, and there is evidence that stroke rates are lower in individuals vaccinated against influenza. Coronavirus disease (COVID-19) has been linked to large vessel occlusions in association with a hyper inflammatory and hypercoagulable state.

TREATMENT OF STROKE

The treatment of a stroke is a medical emergency, and the specific approach depends on the type of stroke (ischemic or hemorrhagic) and how quickly the patient seeks medical attention. Stroke treatment aims to restore blood flow to the brain, minimize brain damage, and prevent complications. Here are the key components of stroke treatment:

1. Ischemic Stroke Treatment:

Thrombolytic Therapy: For eligible patients, intravenous tissue plasminogen activator (tPA) is administered within a few hours of symptom onset to dissolve the blood clot causing the ischemic stroke. In some cases, tPA can be directly delivered to the clot through an intra-arterial procedure.

Mechanical Thrombectomy: In cases of large vessel occlusion, where tPA alone may not be sufficient, mechanical thrombectomy is performed. A catheter is used to remove or break up the clot, often with the assistance of a stent retriever or aspiration device. This procedure is highly effective when performed promptly.

Antiplatelet Medications: Antiplatelet drugs like aspirin may be given to prevent further clot formation.

Blood Pressure Management: Blood pressure may be controlled to prevent further damage to the brain.

2.Hemorrhagic Stroke Treatment:

Surgical Intervention: In cases of intracerebral hemorrhage (bleeding within the brain), surgery may be necessary to remove the blood clot, relieve pressure on the brain, and repair damaged blood vessels. Aneurysms or arteriovenous malformations (AVMs) may also require surgical treatment.

Blood Pressure Management: Blood pressure is carefully controlled to prevent re-bleeding while ensuring adequate blood flow to the brain.

Coagulation Reversal: If the hemorrhage is due to anticoagulant medications, reversal agents may be administered.

3.Supportive Care:

Monitoring: Stroke patients are closely monitored in an intensive care or stroke unit to manage vital signs, neurological status, and complications.

Medication Management: Medications may be given to manage symptoms, prevent complications (e.g., seizures, infections), and control underlying medical conditions like high blood pressure and diabetes.

Swallowing and Nutrition: Stroke survivors with swallowing difficulties (dysphagia) may receive nutritional support through a feeding tube or dietary modifications.

4. Rehabilitation: One of the most important ways to treat stroke is to help a person recover or adapt to the changes in their brain. That's especially true when it comes to helping them regain abilities they had before the stroke. Stroke rehabilitation is a major part of recovery for most people who have a stroke. Stroke rehabilitation is a crucial component of recovery and can involve various therapies, including:

a) **Speech therapy:** This can help you regain language and speaking abilities and improve your ability to control muscles that help you breathe, eat, drink and swallow. To address communication and swallowing difficulties.
b) **Physical therapy:** This can help you improve or regain the ability to use your hands, arms, feet and legs. This can also help with balance issues, muscle weakness and more. To regain mobility, strength, and balance.
c) **Occupational therapy:** This can help retrain your brain so you can go about your activities of daily life. This therapy is especially helpful with improving precise hand movements and muscle control. To improve skills for daily living and independence
d) **Cognitive therapy/ Neuropsychological Therapy:** This can be helpful if you're having memory problems. It can also help if you have difficulty with activities that require focus or concentration that you could do before. To address cognitive deficits.

Other therapies are possible, depending on your case and circumstances. Your healthcare provider is the best person to tell you what kind of treatments can benefit you.

The goals of rehabilitation are:

- Strengthen motar skills
- Improve mobility
- Limit use of the unaffected limb to encourage mobility in the affected limb
- Use range of motion therapy to ease muscle tension.

5.Secondary Prevention: Stroke prevention strategies are essential to reduce the risk of recurrent strokes and may include lifestyle modifications, medication (e.g., antiplatelet drugs, anticoagulants), and the management of underlying risk factors like hypertension, diabetes, and high cholesterol.

Stroke treatment is time-sensitive, and early intervention is critical for the best outcomes. Recognizing the symptoms of a stroke and seeking immediate medical attention is crucial. The effectiveness of treatment depends on factors such as the type of stroke, the extent of brain damage, and how quickly intervention occurs. Stroke survivors often require ongoing medical care, rehabilitation, and support to maximize their recovery and quality of life.

Herbal Medicinal Plants in Treatment of stroke
Ginseng (P. ginseng):
Ginseng, the root of Panax ginseng, is a well-known traditional Chinese herbal medicine. It is a slow-growing perennial plant with fleshy roots, in the Panax genus, in the family Araliaceae. . Panax ginseng attenuates H_2O_2 – induced oxidative injury. Ginsenoside Rd (GSRd), one of the main active ingredients in Panax ginseng, exhibited remarkable

neuroprotection when presented during oxygen glucose deprivation and reoxygenation, which may be ascribed to its anti-oxidative properties by reducing the intracellular reactive oxygen species and malondialdehyde production; increasing glutathione content; and enhancing the antioxidant enzymatic activities of catalase, superoxide dismutase and glutathione peroxidase (GPx).

Brahmi (Bacopa monnieri) :
Brahmi is an annual creeping plant. Brahmi and chlorpromazine improved the performance of rats in motor learning. Besides its CNS actions it has also been shown to have antioxidant properties in experimental studies. It has also been demonstrated that it has potential to modulate the activities of HSP70, cytochrome P450 and SOD, thereby possibly allowing the brain to be prepared to act under adverse conditions such as stress.

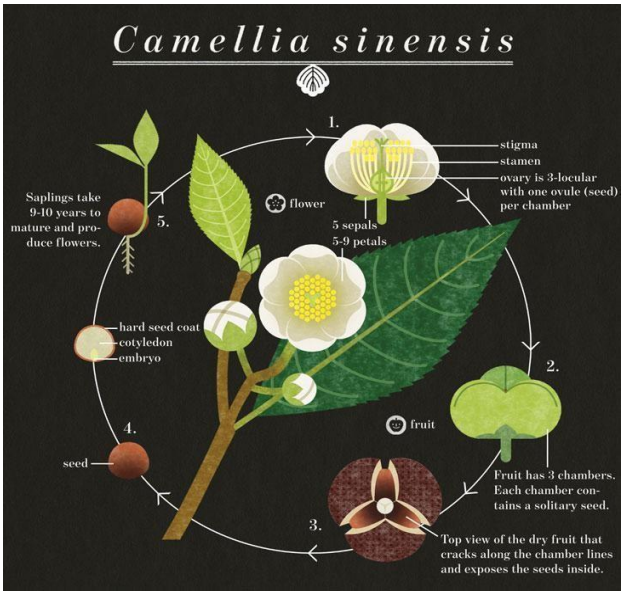
Jatamansi (Nardostachys jatamansi):
It is a popular medicine of the ayurvedic system of medicine. It has been reported as both alcoholic and hexane extracts of jatamansi prevented the lipid peroxidation induced by FeSO4. Because of its anti-lipid peroxidative property, it has a potential against cerebral ischemia

Ocimum basilicum (O. basilicum):
O. basilicum L. commonly known as Sweet Basil.The neuroprotective effect of O. basilicum was evaluated using transient global cerebral ischemia and reperfusion model. Pre-treatment with ethyl acetate extract of O. basilicum significantly elevated brain glutathione content

Shilajit : It has been demonstrated that the antioxidant potential of processed Shilajit when compared with unprocessed Shilajit and vitamin C (ascorbic acid), peak levels of Shilajit occurred 12–15 hours after ingestion and took more than 72 hours to metabolize. Processed Shilajit showed significant antioxidant activity, may be beneficial in stroke.

Ocimum sanctum (O. sanctum) :
Ocimum tenuiflorum, also known as O. sanctum, holy basil, is an aromatic plant in the family Lamiaceae . The occlusion of bilateral common carotid artery for 30 min followed by 45 min reperfusion caused up-regulation of superoxide dismutase (SOD) activity. The increased SOD activity is, therefore, an indication that the brain's antioxidant machinery is activated in response to excessive generation of free radicals. O. sanctum pretreatment significantly prevented the rise in methane dicarboxylic aldehyde (MDA) levels and up-regulation of SOD activity.

Camellia sinensis :
Green tea is made from Camellia sinensis leaves that have undergone minimal oxidation during processing. The hydrogen peroxide level of brain was significantly increased by the ischemia/reperfusion. Eicosanoid concentration was significantly elevated in the ipsilateral hemisphere by the ischemia/reperfusion compared to contralateral hemisphere and the elevated eicosanoids concentrations were significantly reduced by the 0.5% green tea extract pretreatment for 3 weeks.



Artemisia absinthium (A. absinthium):

Absinthium L. (family: Asteraceae). Absinthium extracts have both in vitro and in vivo free radical scavenging activity. The A. absinthium extract exhibited neuroprotection as it is evident from the reduction of infarct volume and lipid peroxidation, and restoration of endogenous antioxidants. Focal cerebral ischemia was induced by middle cerebral artery occlusion (MCAO) for 90 min followed by reperfusion for 24 h. The focal MCAO-induced increase in lipid peroxidation and administration of A. absinthium before focal cerebral ischemia markedly decreased ischemia and reperfusion-induced increase in the level of thiobarbituric acid reactive substances.

Lavandula officinalis (L. officinalis): L. officinalis is a genus of 39 known species of flowering plants in the mint family, Lamiaceae. The pretreatment of rats with 200 mg of lavender extract caused a significant decrease in the permeability of the blood–brain barrier. Lavender extract reduced serum and brain MDA levels, which proved lavender extract, may increase the antioxidant capacity in brain and serum. The treatment with lavender oil significantly decreased neurological deficit scores, infarct size, the levels of MDA, carbonyl and ROS, and decreased neuronal damage.

Ginkgo biloba L (G. biloba): G.biloba has been used medicinally for thousands of years. Available evidence supports ginkgo for managing dementia, anxiety, schizophrenia, and cerebral insufficiency (insufficient blood flow to brain). Ginkgo should be used cautiously in individuals with clotting disorders or taking blood thinners, or prior to some surgical or dental procedures, due to reports of bleeding.

G. biloba extract protect brain neurons against oxidative stress induced by peroxidation, decrease neuronal injury following ischemia or electroconvulsive shock. Cerebral edema increases intracranial pressure and exacerbates vascular dysfunction impairing cerebral blood flow. The brain edema in the hippocampal region is increased following global cerebral ischemia and reperfusion, and in a dosedependent way, reduced by pre-treatment with the G. biloba extract.

G. biloba extract pre-treatment reduces nitrite and nitrate overproduction after transient bilateral carotid occlusion, thus indicating an inhibitory effect of the extract on nitric oxide formation following transient brain ischemia and reperfusion.

Gastrodia elata (G. elata)

G. elata is an herb of the Orchidaceae family. G. elata extract has protective effect on the hippocampal neuronal damages following transient global ischemia in gerbils. Several antioxidants are known to inhibit the neuronal damage caused by the transient global ischemia and excitotoxicity. G. elata extract provides neuroprotection by preventing brain damage through the increased expression of genes encoding antioxidant proteins after transient focal cerebral ischemia and reperfusion. This may be effective as neuroprotective agents at the cellular and molecular levels in the brain.

Ashwagandha: Also known as Indian ginseng, ashwagandha has antioxidant properties that may prevent and treat stroke.

Garlic: Preventing blood clotting and destroying plaque are two potential benefits of garlic.

Gout kola: This herb has been shown to boost cognitive function in people who've had strokes.

Turmeric: A spice, turmeric may lower cholesterol levels and help prevent blockages in arteries.

PREVENTION OF STROKE

There are many things you can do to reduce your risk of having a stroke. While this doesn't mean you can prevent a stroke, it can lower your risk. Actions you can take include:

1.Regular Check-Ups: High blood pressure and cholesterol do not have visible symptoms. Regular health tests are the only way to know if these are present. Blood tests and health checkups can help

detect these problems early and allow for timely treatment with your healthcare provider.

2.Exercise Regularly: An active lifestyle reduces the risk of diabetes, high blood pressure, high cholesterol, and other conditions that increase the risk of ischemic stroke. Engage in at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity aerobic activity per week, as recommended by guidelines.

3.Maintain a Healthy Diet: A diet should be low in "bad" fats, such as saturated and trans fats. People should also limit their sodium intake.

-Eating more fruits, vegetables, whole grains, healthful fats, and lean proteins can help them preserve . Cardiovascular health.

- Limit salt (sodium) intake to reduce the risk of hypertension.

- Control portion sizes to manage weight.

4.Maintain a Healthy Weight: If a person is overweight or has obesity, reaching a healthy body weight can bring down their risk for stroke. Achieve and maintain a healthy weight through a balanced diet and regular exercise.

5.Smoking: Smoking and inhaling smoke from others can cause damage to blood vessels and increase the risk of stroke-related health problems. Quitting smoking is one of the most effective ways to reduce stroke risk.

6.Limit Alcohol Consumption: If you drink alcohol, do so in moderation. Excessive alcohol consumption can contribute to hypertension and other health problems.

7.Control High Blood Pressure (Hypertension): High blood pressure is a leading risk factor for strokes. Monitor your blood pressure regularly, and work with your healthcare provider to manage and control it through lifestyle changes and, if necessary, medication.

8.Control Cholesterol Levels: High levels of LDL cholesterol ("bad" cholesterol) are linked to atherosclerosis and an increased risk of stroke. Manage cholesterol levels with diet, exercise, and, if necessary, medications prescribed by your healthcare provider.

9.Manage Diabetes: If you have diabetes, keep your blood sugar levels under control through diet, exercise, medication, and regular monitoring.

10.Manage Atrial Fibrillation (AFib): If you have Atrial fibrillation, a heart rhythm disorder that can lead to blood clots and stroke, work with your healthcare provider to control it and reduce the risk of clot formation.

11.Manage Other Heart Conditions: Treat and control conditions like heart disease, heart valve disorders, and enlarged heart chambers, as these can increase stroke risk.

12.Medications: Depending on your risk factors, your healthcare provider may prescribe medications such as antiplatelet drugs (e.g., aspirin) or anticoagulants (e.g., warfarin or direct oral anticoagulants) to prevent blood clots and reduce stroke risk.

13.Stroke Education and Awareness: Be aware of the signs and symptoms of a stroke (FAST: Face, Arm, Speech, Time) and seek immediate medical attention if you or someone else experiences them.

Stroke prevention is a lifelong commitment to maintaining a healthy lifestyle and managing risk factors. Working closely with your healthcare provider to address individual risk factors and following their guidance is crucial in reducing the risk of stroke and maintaining overall cardiovascular health.

REFERENCES:

1. Shakir R. The struggle for stroke reclassification. Nat. Rev. Neurol. 2018;14:447–448. Doi: 10.1038/s41582-018-0036-5. [PubMed] [CrossRef] [Google Scholar].
2. Chandril chugh by 2019 Introduction to stroke [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6707502/].
3. World Health Organisation (1978). Cerebrovascular Disorders (Offset Publications). Geneva: World Health Organization. ISBN 978-92-4-170043-6. OCLC 4757533.
4. Clinic in Cleveland, Ohio by 22/09/2022 Cleveland Clinic Main Campus [https://my.clevelandclinic.org/health/diseases/5601-stroke].
5. Diji Kuriakose and Zhi Cheng Xiao by 2020 Epidemiology of stroke [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7589849/].
6. Stephen JX. Murphy and David J. Werring ischemic stroke [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7409792/].
7. Al-Shahi Salman R, Labovitz DL, Stapf C (July 2009). "Spontaneous intracerebral haemorrhage". BMJ. 339 (jul24 1): b2586.

doi:10.1136/bmj.b2586. PMID 19633038. S2CID 206891608[https://en.m.wikipedia.org/wiki/Stroke].

8. Medically reviewed by Heidi Moawad, M.D. - By James McIntosh - Updated on January 6, 2023[https://www.medicalnewstoday.com/articles/7624#treatment].
9. Kidwell CS, Chalela JA, Saver JL, Starkman S, Hill MD, Demchuk AM, et al. (October 2004). "Comparison of MRI and CT for detection of acute intracerebral hemorrhage". JAMA. 292 (15): 1823–30. Doi:10.1001/jama.292.15.1823. PMID 15494579. [https://en.m.wikipedia.org/wiki/Stroke].
10. Diji Kuriakose and Zhi Cheng Xiao by 2020 [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7409792/][https://www.ncbi.nlm.nih.gov/pmc/ar ticles/PMC7589849/].
11. Clinic in Cleveland, Ohio by 22/09/2022 [https://my.clevelandclinic.org/health/diseases/5601stroke]
12. [https://www.sciencedirect.com/science/article/pii/S2221169115001604][https://www.researchgate.net/publication/343058692_A_Review_on_Use_of_Some_Herbal_Medicinal_Plants_in_Treatm ent_of_Cerebral_Stroke]
13. Medically reviewed by Heidi Moawad, M.D. – By James McIntosh – Updated on January 6, 2023[https://www.medicalnewstoday.com/articles/7624#treatment]
14. National Institute of Neurological Disorders and Stroke by 5-may-2021 [https://medlineplus.gov/stroke.html]
15. By Annette McDermott — Updated on October 22, 2019[https://www.healthline.com/health/stroke/alternative-treatments#supplements]